

Attachment L1

Activated Carbon Injection (ACI) Cost Equations in v.2.1.6 (Part I)

The technology specifically designated for mercury control in v.2.1.6 policy runs is Activated Carbon Injection downstream of the combustion process in coal fired units. For v.2.1.6, data on the cost and performance of ACI were updated beyond the pilot study by U.S. Department of Energy's National Energy Technology Laboratory (NETL) and EPA's Office of Research and Development (ORD) that was used in v.2.1.

Tables L1-1 and L1-2 provide illustrations of the costs resulting at ACI mercury removal rates of 90% and 60% respectively. These tables show the costs for all 26 NETL-ORD coal types and control configurations at a 500 MW coal unit with a heat rate of 10,000 Btu/kWh. (Definitions of the control technology acronyms appearing in this table are given in Table L1-3. The coal sulfur grades shown in Tables L1-1 and L1-2 are defined as follows: coal with a sulfur content greater than 1.8% (by weight) is defined as "high sulfur" coal; coal with a sulfur content of 1.8% or lower (by weight) is considered "low sulfur" coal.) Note that due to constraints on model size and run time, the 60% removal option is intended to be applied only on selected sensitivity analysis runs.

For a detailed discussion of how the NETL-ORD study was used to derive the results shown in the tables in this attachment, refer to section 5.3.3 and Appendix A 5.3.2 in "Documentation of EPA Modeling Applications (V.2.1) Using the Integrated Planning Model" which can be viewed and downloaded at www.epa.gov/airmarkets/epa-ipm.

Table L1-1: Cost Components for 90% Mercury Removal Efficiency Using ACI, for Representative 500 MW, 10,000 Btu/kWh Heat Rate Unit

Coal Type	Existing Pollution Control Technology	Sulfur Level	Capital Cost (1999\$/kWh)	FOM (1999\$/kW/yr)	VOM (1999mills/kWh)	Removal Efficiency (%)	
Bituminous	ESP	L	37.17	5.29	0.27	90	
Bituminous	ESP/O	L	37.17	5.29	0.27	90	
Bituminous	ESP+FF	L	1.73	0.80	0.22	90	
Bituminous	ESP+FGD	H	52.24	7.20	0.31	90	
Bituminous	ESP+FGD+SCR	H	ACI not applicable				
Bituminous	ESP+SCR	L	37.17	5.29	0.27	90	
Bituminous	FF	L	1.73	0.80	0.22	90	
Bituminous	FF+DS	H	1.77	0.81	0.23	90	
Bituminous	FF+FGD	H	1.77	0.81	0.23	90	
Bituminous	HESP	L	37.17	5.29	0.27	90	
Bituminous	HESP+FGD	H	52.24	7.20	0.31	90	
Bituminous	HESP+SCR	L	37.17	5.29	0.27	90	
Bituminous	PMSCRUB+FGD	H	52.24	7.20	0.31	90	
Bituminous	PMSCRUB+FGD+SCR	H	ACI not applicable				
Bituminous	ESP	H	52.79	7.27	0.42	90	
Bituminous	ESP/O	H	52.79	7.27	0.42	90	
Bituminous	ESP+FF	H	2.32	0.87	0.34	90	
Bituminous	ESP+FGD	L	36.76	5.24	0.20	90	
Bituminous	ESP+FGD+SCR	L	ACI not applicable				
Bituminous	ESP+SCR	H	52.79	7.27	0.42	90	
Bituminous	FF	H	2.32	0.87	0.34	90	
Bituminous	FF+DS	L	1.32	0.75	0.14	90	
Bituminous	FF+FGD	L	1.32	0.75	0.14	90	
Bituminous	HESP	H	52.79	7.27	0.42	90	
Bituminous	HESP+FGD	L	36.76	5.24	0.20	90	
Bituminous	HESP+SCR	H	52.79	7.27	0.42	90	
Bituminous	PMSCRUB+FGD	L	36.76	5.24	0.20	90	
Bituminous	PMSCRUB+FGD+SCR	L	ACI not applicable				
Lignite	ESP	L	72.28	9.66	0.55	90	
Lignite	ESP+FF	L	14.07	2.28	0.45	90	
Lignite	ESP+FGD	L	72.28	9.66	0.55	90	
Lignite	FF+DS	L	72.28	9.66	0.55	90	
Lignite	FF+FGD	L	14.07	2.28	0.45	90	
Subbituminous	ESP	L	48.33	6.70	0.38	90	
Subbituminous	ESP+DS	L	48.33	6.70	0.38	90	
Subbituminous	ESP+FGD	L	48.33	6.70	0.38	90	
Subbituminous	ESP+SCR	L	48.33	6.70	0.38	90	
Subbituminous	FF	L	2.16	0.85	0.30	90	
Subbituminous	FF+DS	L	48.33	6.70	0.38	90	
Subbituminous	FF+FGD	L	2.16	0.85	0.30	90	
Subbituminous	HESP	L	48.33	6.70	0.38	90	
Subbituminous	HESP+FGD	L	48.33	6.70	0.38	90	
Subbituminous	HESP+SCR	L	48.33	6.70	0.38	90	
Subbituminous	PMSCRUB	L	48.33	6.70	0.38	90	
Subbituminous	PMSCRUB+FGD+SCR	L	48.33	6.70	0.38	90	

Table L1-2: Cost Components for 60% Mercury Removal Efficiency Using ACI, for Representative 500 MW, 10,000 Btu/kWh Heat Rate Unit

Coal Type	Existing Pollution Control Technology	Sulfur Level	Capital Cost (1999\$/kWh)	FOM (1999\$/kW/yr)	VOM (1999mills/kWh)	Removal Efficiency (%)	
Bituminous	ESP	L	3.85	1.06	0.71	60	
Bituminous	ESP/O	L	3.85	1.06	0.71	60	
Bituminous	ESP+FF	L	0.84	0.69	0.07	60	
Bituminous	ESP+FGD	H	3.26	0.98	0.56	60	
Bituminous	ESP+FGD+SCR	H	ACI not applicable				
Bituminous	ESP+SCR	L	3.85	1.06	0.71	60	
Bituminous	FF	L	0.84	0.69	0.07	60	
Bituminous	FF+DS	H	1.12	0.73	0.11	60	
Bituminous	FF+FGD	H	1.12	0.73	0.11	60	
Bituminous	HESP	L	36.28	5.19	0.13	60	
Bituminous	HESP+FGD	H	51.59	7.12	0.20	60	
Bituminous	HESP+SCR	L	36.28	5.19	0.13	60	
Bituminous	PMSCRUB+FGD	H	3.26	0.98	0.56	60	
Bituminous	PMSCRUB+FGD+SCR	H	ACI not applicable				
Bituminous	ESP	H	5.18	1.21	1.11	60	
Bituminous	ESP/O	H	5.18	1.21	1.11	60	
Bituminous	ESP+FF	H	1.12	0.73	0.11	60	
Bituminous	ESP+FGD	L	2.43	0.88	0.36	60	
Bituminous	ESP+FGD+SCR	L	ACI not applicable				
Bituminous	ESP+SCR	H	5.18	1.21	1.11	60	
Bituminous	FF	H	1.12	0.73	0.11	60	
Bituminous	FF+DS	L	0.84	0.69	0.07	60	
Bituminous	FF+FGD	L	0.84	0.69	0.07	60	
Bituminous	HESP	H	51.59	7.12	0.20	60	
Bituminous	HESP+FGD	L	36.28	5.19	0.13	60	
Bituminous	HESP+SCR	H	51.59	7.12	0.20	60	
Bituminous	PMSCRUB+FGD	L	2.43	0.88	0.36	60	
Bituminous	PMSCRUB+FGD+SCR	L	ACI not applicable				
Lignite	ESP	L	17.29	2.67	1.37	60	
Lignite	ESP+FF	L	12.72	2.12	0.18	60	
Lignite	ESP+FGD	L	17.29	2.67	1.37	60	
Lignite	FF+DS	L	70.93	9.50	0.29	60	
Lignite	FF+FGD	L	12.72	2.12	0.18	60	
Subbituminous	ESP	L	4.80	1.17	0.99	60	
Subbituminous	ESP+DS	L	47.21	6.57	0.18	60	
Subbituminous	ESP+FGD	L	4.80	1.17	0.99	60	
Subbituminous	ESP+SCR	L	1.04	0.72	0.10	60	
Subbituminous	FF	L	1.04	1.02	0.18	60	
Subbituminous	FF+DS	L	47.21	6.57	0.18	60	
Subbituminous	FF+FGD	L	1.04	0.72	0.10	60	
Subbituminous	HESP	L	47.21	6.57	0.18	60	
Subbituminous	HESP+FGD	L	47.21	6.57	0.18	60	
Subbituminous	HESP+SCR	L	47.21	6.57	0.18	60	
Subbituminous	PMSCRUB	L	4.80	1.17	0.99	60	
Subbituminous	PMSCRUB+FGD+SCR	L	4.80	1.17	0.99	60	

Table L1-3: Definition of Acronyms for Existing Controls

Acronym	Description
ESP	Electro Static Precipitator - Cold Side
HESP	Electro Static Precipitator - Hot Side
ESP/O	Electro Static Precipitator - Other
FF	Fabric Filter
FGD	Flue Gas Desulfurization - Wet
DS	Flue Gas Desulfurization - Dry
SCR	Selective Catalytic Reduction
PMSCRUB	Particulate Matter Scrubber